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Geology of Currie and Bowman Townships

District of Cochrane

By
E. J. LEAHY

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COLOURED GEOLOGICAL MAP
(Back Pocket)

Map No. 2071—Currie and Bowman Townships, District of Cochrane. Scale, 1 inch to ½ mile.

Abstract

This report describes the geology of Currie and Bowman townships in the District of Cochrane. In 1944, detailed mapping was begun in that part of the Porcupine gold belt north and east of Matheson. Currie and Bowman townships were mapped in 1962 and 1963 at a scale of 1 inch to $\frac{1}{4}$ mile, as part of a plan to map the area between Matheson and Timmins in more detail than has previously existed.

Fig. 1—Key-map showing the location of Currie and Bowman townships. Scale, 1 inch to 50 miles.

Most of the outcrop is found in the south-central part of the map-area. The area is underlain by Precambrian rocks consisting of acidic and basic volcanic rocks intruded by gabbro, granite, syenite, acidic porphyries, and diabases. A few outcrops of acidic volcanic rocks may indicate a marker horizon correlated with similar rocks found in Hislop and Guibord townships.

Pleistocene deposits of clay, sand, and gravel cover most of the area, and excellent boulder beach ridges formed by glacial lake Barlow-Ojibway are found.

Several gold showings and one minor copper showing are described. There has been no mineral production from the map-area.

Gravel deposits in the map-area have been exploited for many years and an attempt to develop a clay brick plant was made.

Geology of Currie and Bowman Townships, District of Cochrane

by

E. J. Leahy[1]

INTRODUCTION

Currie and Bowman townships, in the District of Cochrane, are located in the eastern extension of the Porcupine greenstone belt. The centre of the map-area is 36 miles east of Timmins.

The Destor-Porcupine Fault zone, extending eastward from the Timmins area into Quebec, is located between 1 and 2 miles north of the two townships (O.D.M. map No. 2046, 1964.).

Currie and Bowman townships have been subjected to sporadic prospecting since at least 1917; one gold discovery in Currie township resulted in a mild staking rush, but in general, nothing has been discovered in the map-area to cause concentrated development work. Most of the prospecting has been for gold; a small copper showing in southern Bowman township has been investigated by diamond-drilling and trenching. Sand and gravel deposits in the northern part of the area have been a good source of road-building material and fill for many years. In 1963 several of these gravel pits were in operation, and other gravel areas were being tested for future exploitation in Bowman township.

Highway No. 11 diagonally crosses the northeast quarter of Bowman township and then coincides with the northern limit of the two townships. The northern three concessions of both townships and the eastern side of Bowman township are easily accessible by good clay and gravel roads adjoining the highway. South of the third concession line, the roads, in general, are not suitable for motor vehicles, especially during rainy seasons.

The Ontario Northland railway crosses the northeast corner of Bowman township and has station facilities at Matheson, a town with a population of approximately 1,000 persons in the northeast part of the township.

Geological mapping for this report was conducted in the summers of 1962 and 1963, on a scale of 1 inch to ¼ mile, using air photographs obtained from the Ontario Department of Lands and Forests for control. Areas of known rock outcrop were traversed at intervals of 660 feet in a direction perpendicular to the regional strike of the main rock formation. Areas where outcrop was likely to occur, but which was not evident on the air photographs, were traversed by running compass lines from a known point directly to the area, no effort being

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made to cover these areas in a systematic manner. Everyone residing in the map-area, who could provide information, was questioned about the possibility of other outcrops and the author believes that most, if not all, of the exposed rock in the area has been examined.

Acknowledgments

In 1962, when field work was started in Currie township, the author was assisted by D. W. Hogg. In 1963, the remainder of Currie township and all of Bowman township were mapped with the assistance of P. T. George, T. M. Seward and G. T. Hayes. Mr. George, acting as senior assistant, carried out independent mapping over most of the field season.

Several profitable discussions were held with H. D. Carlson, resident geologist in the Timmins office of the Ontario Department of Mines, both at his office and in the map-area.

The writer would like to express his gratitude to Bert Hill of the Matheson office of the Ontario Department of Lands and Forests, for the use of air photographs in both 1962 and 1963.

Geological information supplied by Sylvanite Gold Mines Limited to the Ontario Department of Mines, has been most helpful in preparing the section on economic geology.

Nearly all of the residents of the map-area, outside of the town of Matheson, were consulted for information and all were as helpful as possible.

P. E. Giblin, geologist of the Ontario Department of Mines, was most helpful to the author in the preparation of this report.

Previous Geological Work

On the map of the gold area between Lake Abitibi and Night Hawk Lake (O.D.M. map No. 28b), the geology of Bowman township is shown on a scale of 1 inch to 2 miles; this appears to be the first map to show the geology of the township. On the map accompanying the report on the geology and ore deposits of the Ramore area (Moore 1937, map No. 45d), the geology of Bowman township is shown on a scale of 1 inch to ¾ mile.

A report on the geology of Currie township, as well as four townships west and north of it, has previously been published along with a map at the scale of 1 inch to 1 mile (Laird 1931, map No. 40b).

The most detailed maps available for the geology of the townships immediately surrounding Currie and Bowman townships are as follows: Hislop township (Prest 1957, map No. 1955-5); Carr township (Prest 1952, map No. 1951-1); Taylor township (compiled by Satterly 1960, map No. P.39); Bond township (Leahy 1962, map No. P.161); Egan township (Wright 1922, map No. 31d); McCann township (Moore 1937, map No. 45d).

There has been very little assessment work recorded for the map-area. This is available for inspection at the Timmins office of the Ontario Department of Mines.

Topography and Drainage

Currie and Bowman townships are located in the clay belt which extends across northern Ontario and Quebec. In the map-area, hills of sand and gravel

and bedrock project through a low, often swampy, dissected clay plain. Most of the exposed bedrock is found in the south half of Bowman township and the southeast quarter of Currie township. For the most part, hills of sand and gravel are confined to an irregular strip extending north-south through the east part of Bowman township, and to the area adjacent to Grassy and Levacque lakes in north-central Currie township.

The elevation of the railway at Matheson station is 861 feet above sea level; the town is built on the clay plain and Knight *et al* (1919, p. 37) reported that well holes put down in the town have passed through over 100 feet of drift cover. Approximately 6 miles southwest of Matheson, a reported geodetic marker on the rock outcrops in lot 10, concession 1, Bowman township has an elevation of 1,276 feet above sea level (O.D.M. map No. 45d). Thus there is a relief difference of 415 feet between these two locations.

View to the south from the north-central boundary line of the map-area. The undulating clay plain (foreground) extends south for five miles to the high hills of volcanic rocks (background), fringing the granitic area.

This difference in elevation of 415 feet is not taken up by a steady rise of the land surface between the two points. Most of this relief difference occurs at the rock outcrop in concessions I and II and the most rapid changes in height are found in the volcanic rocks around the edge of the large granite intrusion in the west half of concession I. It would appear that the intrusion of the granitic mass into the volcanic rocks has brought about a hardening effect on the volcanic rocks along the contact zone, making them more resistant to erosion; the granitic rocks have been eroded much more readily. In Egan and McCann townships, just south of Currie and Bowman townships respectively, this relationship between the volcanic rocks and the granitic intrusion along their contact zone seems to hold true. To the south, a rather large basin, underlain by granitic rocks, and rimmed by a fairly continuous series of hills formed by hardened volcanic rocks, can be seen from the high hills in the south-central part of the map-area.

The intrusion of diabase into other rock types appears to exert a hardening effect upon them; a large proportion of outcrops in the map-area have a backbone of diabase, which often weathers as a slight trough. Often when the diabase disappears beneath the drift cover, its extension can still be inferred for a short distance by a slight swell in the land surface.

The remaining high hills in Currie and Bowman townships consist of glaciofluvial deposits of sand and gravel. These hills are covered on their lower flanks by layered clay deposits of glaciolacustrine origin, which extend over most of the remaining map-area.

The Black River, in the northeast part of Bowman township, is the largest river in the area. It is joined, west of Matheson, by the Watabeag River flowing north through the eastern side of Currie township. The Watabeag River is useless as an access route because of numerous rapids and log jams. On the south township line the Watabeag River falls about 15 feet at Egan Chutes.

The lakes in the clay-covered areas, such as Grassy and Grove lakes, are shallow, dirty, and marshy along their shores; the lakes in the sandy areas, such as Anderson and Cherry lakes, are clean and clear.

Creeks in the area are too small for canoe travel. Beaver dams are numerous along them, especially in the south half of Currie township where much of the ground is flooded, making access to rock outcrops difficult.

Natural Resources

At the time of mapping, spruce and poplar were being cut for pulpwood in the central part of the map-area. There is much slash in this location.

Jackpine is the dominant tree type on the sand and gravel deposits. Low clay areas are usually marshy and sustain spruce, poplar, and alder. The higher clay areas support mostly poplar, alder, and some birch; quite often there is a ring of birch trees around the rock outcrops.

Judging from the amount of once-cleared land, which is now being overrun with scrub bush, there must have been many individual attempts to establish farms in the map-area. The remaining farms are small, growing hay, root crops, and some cereals, and raising a few cattle. Farmers, who have kept their efforts almost solely directed to the development of agriculture, reported to the author that the land is good for farming.

In general, the abandonment of the farms has been followed by a state of poor repair for township roads and bridges.

GENERAL GEOLOGY

The bedrock formations observed in Currie and Bowman townships are all of Precambrian age. The oldest rocks are mostly intermediate to basic lavas with minor pyroclastic horizons which are acidic in composition. These volcanic rocks are all considered to be of Keewatin age. One gabbro sill and several varieties of granitic rocks intrude the Keewatin, but the relationship between the gabbro and the granite was not determined. Using a classification of rock ages according to type, the gabbro may be of Haileyburian age and the granitic rocks Algoman in age. All of these rocks are cut by northerly-trending diabase dikes considered to be Matachewan in age. The youngest rock type

observed is found as northeasterly-trending diabase dikes which are considered to be Keweenawan in age.

Strong epidote alteration is found in all of these Precambrian rocks in the map-area, the degree of alteration varying considerably from place to place in any one rock type.

Unconsolidated deposits of sand, gravel, and clay cover most of the area. These deposits are of Pleistocene age.

TABLE OF FORMATIONS

CENOZOIC	
RECENT	Lake, swamp, and stream deposits.
PLEISTOCENE	Sand, gravel, and clay.
	Unconformity
PRECAMBRIAN	
KEWEENAWAN	Diabase, olivine diabase, quartz diabase.
	Intrusive Contact
MATACHEWAN	Diabase, quartz diabase, with porphyritic phases and minor granitic phases.
	Intrusive Contact
ALGOMAN(?)	Granite and syenite and related porphyries, feldspar porphyries, quartz-feldspar porphyries, aplite, pegmatite, quartz veins, lamprophyre dikes.
	Intrusive Contact
HAILEYBURIAN(?)	Gabbro.
	Intrusive Contact
KEEWATIN	Acid to Intermediate Volcanic Rocks: Tuff, crystal tuff, fragmental rocks, spherulitic lava.
	Intermediate to Basic Volcanic Rocks: Massive and pillowed lava flows, porphyritic lavas, tuff, agglomerate, amphibolitic and chloritic schist, diabasic lava, variolitic lava.

Keewatin

Intermediate to Basic Volcanic Rocks

The greatest proportion of rock exposed in the map-area consists of dark green to black coloured lavas, which have been classed together as intermediate to basic in composition. Most of these volcanic flow rocks are massive but pillowed flows are not uncommon.

Outcrops of basic lavas are most abundant in the south-central part of the map-area, the largest continuous exposures being found in Bowman township. These large outcrop areas in the southwest corner of Bowman township are separated from those in the southeast by thick deposits of sandy gravel. Only a few outcrops are found in the north half of Bowman township. In Currie township, with the exception of the southeast quarter, outcrops are sparse; the central part of the township is almost completely devoid of any exposed rock.

Many of the massive flows in the southern part of the map-area are quite coarse-grained, and in hand specimen look like altered gabbros or diorites,

sometimes with a poor diabasic texture. They are similar to the rocks referred to as "coarse-textured lavas" in Hislop township (Prest 1957, p. 10).

Knight *et al* (1919, p. 29) state as follows: "The massive gabbro in lot 2, concession II, Bowman township, appears to be of this Pre-Algoman type and younger than the Keewatin. This particular gabbro is intruded by quartz-feldspar porphyry."

In a geological and geophysical survey of this same area by Golden Goose Mines Limited, these gabbroic rocks were mapped as basic volcanic rocks and mention was made in the company report of the difficulty in separating these volcanic rocks from the north-trending diabase dikes. This problem was also encountered during the mapping of this area for this report. No evidence was found that would indicate that these coarse-grained gabbroic rocks were intrusive into the Keewatin lavas. They are believed to be thick coarse-grained flows of the volcanic sequence. As can be seen on the geological map (*see* back pocket, map No. 2071), the rock units referred to as massive gabbroic lava are thicker than, and conformable with, the other volcanic rock types where contacts were discernible; in other areas a contact between massive lava and the gabbroic type was not evident, suggesting that there is a gradation from one to the other solely by grain size.

In thin sections the rocks appear badly altered; feldspars have been obliterated beyond recognition by saussurite, and crystal outlines are lacking. Amphiboles and epidote are the main constituents along with minor magnetite, pyrite, and quartz. A study of one thin section of a massive lava from lot 7, concession III, Bowman township, showed it to contain 15–25 per cent leucoxene.

Several porphyritic flows, both massive and pillowed, are found in the south-central part of the map-area. These rocks are lighter green in colour than most of the volcanic rocks and contain abundant grey feldspar phenocrysts, seldom over ¼ inch long. Laird (1931) reported that the feldspar crystals in the volcanic rocks in lot 5, concession II, Currie township, are really amygdule fillings, some having crystallized enough to assume the shape of primary feldspar phenocrysts. The author studied one thin section of a sample from a massive porphyritic flow in lot 11, concession II, Bowman township; the feldspars are relatively fresh with a composition about $Ab_{65}An_{35}$ and are enclosed in an extremely fine-grained matrix of mafic minerals in which small quartz grains are fairly common as clusters, or isolated grains. The rock is considered to be an andesite porphyry.

The porphyritic lava flows should serve as good marker horizons if more detailed studies are needed in this area. In concession II, Bowman township, it was sometimes difficult to decide if some of the narrow porphyritic rock units, conformable to the strike of the volcanic sequence, were extrusive rocks or intrusive feldspar porphyry sills. Probably both types are represented in this area.

Near the contact of the large granitic intrusion and the volcanic rocks in southwest Bowman township, the volcanic rocks are very black in colour. The weathered surface is pitted by the weathering out of certain minerals around clusters or knots of other minerals. A faint gneissic texture is usually discernible and in a few places the rock could be called a schist. In thin section, amphibole grains show a sub-parallel arrangement; there is considerable quartz in the matrix, much of which is probably secondary in origin; feldspars are completely

altered beyond recognition. This rock type has been given the general name of amphibolitic lava on the geological map (back pocket).

Minor basic tuff and agglomerate beds are found in the southwest quarter of Bowman township. Small amygdule fillings of quartz are found in the basic volcanic rocks in lot 1, concession VI, Currie township.

In lot 3, concession I, Currie township, white feldspar laths, up to $\frac{1}{8}$ inch long, in a black groundmass give some of the volcanic rocks a fairly good diabasic texture. In an earlier report (Laird 1931), a far greater proportion of the rock in this location was represented as intrusive diabase than was found during the mapping for this present report; this diabasic lava probably is the rock referred to.

Epidote alteration of the basic volcanic rocks is very common over the whole map-area. Joint planes and fissures in these rocks usually contain epidote or quartz-epidote fillings. Carbonate alteration is limited to a few outcrops along the Black River just north of Bowman township, and to a minor amount in lot 12, concession III, Bowman township, where hematite staining is evident.

On the geological map, the extension of the basic volcanic rocks under the drift cover has been inferred from published aeromagnetic maps (G.S.C. 1956), and from ground geophysical work, submitted as assessment requirements for work done in southeast Bowman township, in conjunction with the outcrop distribution.

Acid to Intermediate Volcanic Rocks

Only a small portion of the exposed volcanic rocks in Currie and Bowman townships are considered as acidic to intermediate in composition. These rocks are mainly pyroclastic varieties such as tuff, crystal tuff, and coarser fragmental rocks.

Cream-to-buff weathering tuff beds stand out well as marker horizons in the dark basic flows in southwest Bowman township. The thickness of these tuffs is exaggerated on the geological map; they are seldom greater than 40 feet thick and usually less than this. In thin section the tuff is seen to be composed almost wholly of minute anhedral quartz grains with very minor amounts of altered feldspar, mafic minerals, and opaque minerals. Bedding in the tuff is usually discernible in the field as slightly different coloured layers from $\frac{1}{4}$ to $\frac{1}{2}$ inch thick. In thin section the bedding is much more accentuated as thin parallel laminations, which stand out because of the opaque minerals scattered along them.

In lots 6 and 7, concessions IV and V, Bowman township, there are several outcrops of an acidic volcanic rock in which subhedral pink and grey feldspar crystals are very prominent. This rock was formerly mapped as an intrusive feldspar porphyry (Moore 1937); the author believes that the outcrops here represent a complex mixture of tuffs, crystal tuffs, and fragmentals, along with some very thin basic flow rocks and perhaps some intrusive breccia.

Most of these outcrops have a streaky surface, which appears to be a tuffaceous banding, parallel to an east-west shearing. Epidote alteration and streaks of red feldspar give the rock a distinctive appearance. In the outcrop in lot 7, concession V, about 700 feet north of the concession line, the banding in the rock is further emphasized by dark layers containing a high proportion of magnetite. In the outcrop south of this, a mixture of magnetite and carbonate fills some of

the narrow east-west joint cracks; the rock here very closely resembles a feldspar porphyry. Close examination of this outcrop shows it to contain fragments of basic volcanic rock and acid porphyritic rock in a feldspar porphyritic matrix. The outcrop, 50 feet east of the road between lots 6 and 7 in the south half of concession V, contains fragments up to 6 inches in diameter of basic volcanic rocks, felsite, and porphyry.

In Currie township, along strike with the acid volcanic rocks of Bowman township and about 4 miles west of them, two small outcrops of tuff and crystal tuff, intruded by feldspar porphyry, are found adjacent to the Watabeag River. About 5 miles west of these outcrops and still on strike, the outcrops adjacent to the west township boundary of Currie township consist of basic volcanic rock and a peculiar porphyritic volcanic rock.

In Hislop township, several small outcrops of tuff and fragmental rocks are found on the Pike River (Prest 1957), which are on strike with the acid volcanic rocks 6 miles to the west in Bowman township. Similar rock types extend southeast through Hislop township (Prest 1957) and continue into Guibord township (Prest 1953).

The complex series of acid volcanic rocks found in Bowman township have a very distinctive appearance. The author believes that there is a fairly continuous zone of tuffs, crystal tuffs, fragmental rocks of an undetermined origin, and minor intercalated basic flows, which extends across the northern part of the map-area, and that these rocks may be correlated with the zone of similar rocks found in Hislop and Guibord townships. Such a zone could serve as an excellent marker horizon in this region of sparse outcrop. Also, if these rocks in the map-area belong to the same formation as those found on the Pike River in Hislop township, then there would appear to be little or no north-south displacement on the indicated Hislop Fault (Prest 1957, map No. 1955-5).

Haileyburian(?)

A coarse-grained gabbro sill intrudes the volcanic rocks in lots 6 and 7, concession III, Bowman township. Only the south contact of this sill was exposed and here the gabbro contains large fragments of tuff from the volcanic horizon immediately south of it.

The gabbro is quite magnetic, and in thin section, magnetite grains appear to make up 5–10 percent of the rock. Feldspars are badly altered; quartz and apatite are accessory minerals.

Algoman(?)

A large variety of acidic intrusive rocks represents the Algoman period in the map-area. Egan and McCann townships, immediately south of Currie and Bowman townships respectively, are largely underlain by hornblende granite and syenite (Moore 1937; Wright 1922). These granitic intrusions just approach the southern boundary of Currie township but make up a considerable part of the rock in the west half of concession I, Bowman township. Irregularly shaped dikes, sills, and stocks of feldspar porphyry are common in the volcanic rocks adjacent to the margins of the granite; the granite contains many inclusions of volcanic rock.

The granite is generally a medium-grained pink rock. Near the contact with the volcanic rock, phenocrysts of feldspar gradually increase in number. The phenocrysts are of two types and they occur in bunches rather than being evenly distributed throughout the groundmass. Red feldspar crystals up to ¾ inch long are most abundant, and on close inspection are noted to have a grey, mottled appearance and enclose small prisms of hornblende. The other feldspar phenocrysts are equidimensional, seldom up to ½ inch in section, and are white to light grey with a pink outer rim.

The syenite porphyry dikes, so common in the volcanic rocks near the contact with the granite, are worthy of mention because of the interesting appearance of some of them. The porphyry dikes in the south half of lots 3 and 4 concession I, Currie township, are quite variable. In some, bright green epidotization of the complete groundmass surrounds brick red feldspar crystals. Another porphyry consists of light grey feldspars with pink rims, closely packed in a black matrix. Another interesting porphyry was found only in talus fragments at the south end of the outcrop; it consists of elongate tabular pink feldspar crystals closely packed together in parallel arrangement, suggestive of a flow structure. A thin section study by Laird (1931) of one porphyry in this area showed it to consist of phenocrysts of orthoclase and hornblende in a matrix of orthoclase, quartz, and opaque minerals.

In lots 11 and 12, concession I, Bowman township, dikes up to 6 inches in width occur, in which amazonite, the green variety of microcline feldspar, makes up the central zone of the dike and grades into the pink feldspar towards the dike walls. Black tourmaline is a minor constituent of these dikes and it is also found in several granite pegmatite dikes along with coarse muscovite in the same area.

Milky white glassy quartz veins are very common both in the volcanic rocks and the granite in contact zones. Blebs of pink feldspar are usually scattered along the length of these quartz veins. Only one quartz-carbonate vein was noted in this area but quartz-epidote veins are numerous. Sulphides appear to be completely lacking in all of these veins but old prospect pits were seen on many of them. A qualitative spectrographic analysis of a quartz-epidote vein sampled by the author showed it to contain a trace of copper, manganese, titanium, and vanadium.

Throughout the volcanic rocks of the map-area, narrow feldspar and quartz-feldspar porphyry dikes are quite common. Similar dikes have been described in previous reports on other townships in the general area and nothing can be added here to those descriptions.

A porphyritic rock in the south half of lot 2, concession IV, Bowman township, is unlike any others seen in the map-area. White feldspar and hornblende phenocrysts occur in a dense dark blue-green matrix. Several narrow aphanitic bands strike across the porphyry at N.40°E. The writer has included this rock type with the Algoman porphyries but it could well be a porphyritic volcanic rock as previously mapped by Moore (1937).

On the geological map accompanying this report, the eastern edge of the granite pluton in Bowman township has been inferred from geophysical work submitted by Norzinc Mines Ltd. and a published aeromagnetic map (G.S.C., 1956).

Matachewan

Northerly-trending diabase dikes are common in the area. Detailed descriptions of similar dikes are found in reports on the adjacent townships of Carr (Prest 1952) and Hislop (Prest 1957).

The dike in lot 1, concession I, Currie township, has a maximum observed width of 400 feet; most Matachewan dikes in the two townships, as well as the surrounding area, are less than half this width. The dike rocks are equigranular or porphyritic. In the porphyritic dikes, the saussuritized feldspar phenocrysts are usually rounded irregular shapes and they occur in zones parallel to the dike walls. The most striking example of a porphyritic dike is found in lot 7, concession V, Currie township; phenocrysts up to 6 inches in diameter are found here, some of them being subhedral rather than the usual rounded form.

In lots 6 and 7, concessions I and II, Bowman township, narrow granitic dikes, composed essentially of quartz and brick red feldspar, are found in the diabase dikes. These may be late differentiates of the diabase magma and none of them were found to cross the contacts of the diabase itself. Some of these granitic dikes grade into quartz veins along strike, and small quartz crystal vugs were noticed in one such vein. In the extreme north edge of lot 7, concession I, Bowman township, the granitic dikes form a boxwork pattern, as if filling the rectangular joint system, which is common to most of the diabase dikes.

Keweenawan

Northeasterly-trending diabase dikes represent the Keweenawan period in the map-area. These dikes are of great length; the one passing through the northwest corner of Currie township can be traced by outcrop and aeromagnetic data for over 50 miles through the neighbouring townships. It is interesting to note that several fine-grained basic dikes, with long thin bladed feldspars, weave back and forth across this dike throughout at least 15 miles of its length.

The diabase dike, extending from the southeast quarter of Currie township to the northeast corner of Bowman township, has been traced northeast for about another 6 miles into Beatty township (Satterly and Armstrong 1949): here the dike appears to be faulted off, but has been located farther north, where it continues northeasterly into Munro township (Satterly 1952). This dike differs from typical Keweenawan dikes in that in hand specimen it shows a considerable amount of both pink and grey feldspars, and the rock is generally a lighter colour. More details of this dike are found in the report on the geology of Carr township (Prest 1952).

Pleistocene

Unconsolidated deposits of sand, gravel, and clay in Currie and Bowman townships, are mostly, if not all, of glaciofluvial and glaciolacustrine origin. The area between the two diabase dikes on the outcrop, in the north half of lot 11, concession I, Currie township, is covered with angular to subrounded, unsorted pebbles and boulders, which may represent an ablation till.

The few observations taken of glacial striae indicate that the direction of ice movement ranged between south and S.30°E., at the time when ice last covered the area.

Boulder beach ridge in lot 4, concession III, Bowman township.

Boulder beach material. Note the absence of fine-grained material between the well-rounded loosely packed boulders.

Just south of Matheson, hills of sand and gravel rise very abruptly to form a high zone of stratified glaciofluvial deposits, which are continuous southward through the whole length of Bowman township. The surface of these deposits is quite hummocky, and from strikes and dips, observed where the deposits have been opened up as a source of constructional material, it appears that many of these hummocks have a distinct domical structure. The steep margins of the deposits and the domical structures suggest that these deposits are probably ice-contact features and represent coalescing kames.

In the southern two concessions of Bowman township, the glaciofluvial deposits spread out laterally into a fan-shaped structure covering most of lots 4, 5, and 6. Here the deposits are much more sandy than those further north, and large erratic boulders are plentiful. There are a few kettle depressions. In this region the glaciofluvial deposits resemble an outwash plain.

With the recession of the glacier ice and the following formation of glacial lake Barlow-Ojibway, the map-area was water-covered, with the possible exception of some of the higher rock areas and the highest sand and gravel deposits. Alternating clay and silt beds, laid down in the glacial lake waters, covered most of the area. The bedding of these lake deposits conforms generally to the underlying topography. In some of the gravel pits in lot 4, concession VI, Bowman township, it was noted that the clays were draped conformably over the hummocky kame deposits and have primary dips up to 40°. In the gravel pit east of Jean Lake, the dip of strata changes very markedly with height. The bottom layers of this pit are relatively thick flat-lying beds of medium- to coarse-grained gravels. With increasing elevation, beds become thinner, sandy layers more frequent, and the dips of the beds gradually increase. At the top of the pit, over 60 feet above the floor, pebble and sand beds dip as much as 60°, and these in turn are capped by laminated clays with the same dip.

Excellent boulder ridges, representing former shoreline positions of glacial lake Barlow-Ojibway, are found along the sides of some of the higher rock and gravel hills. In lot 4, concession III, Bowman township, waves hitting the shoreline of the former glacial lake abutting against the sand and gravel deposits, succeeded in removing most of the finer-grained material, leaving a spectacular ridge of large boulders along the side of the hill. In lot 9, concession I, Bowman township, there is a similar boulder beach consisting of at least six distinct steps, each indicating successive lake levels. In the outwash deposit in the south part of Bowman township there are some pronounced bouldery ridges which may also represent old shorelines.

Some of the lowland areas immediately adjacent to the glaciofluvial deposits have a thin layer of fine sand overlying the glacial lake clays. This sand capping represents the fine material removed by waves as the boulder beach ridges were being formed.

STRUCTURAL GEOLOGY

Volcanic flows strike generally in an east-west direction over the whole map-area. There are local deflections from this, the most noticeable being the bending of the flows around the edge of the granite intrusion in the south-central part of the area. The dip of the flows appears to be limited between vertical and 75° to the south. The tops of flows, as indicated by pillow top determina-

tions, all face to the south. Generally speaking, the whole volcanic sequence appears to be part of a large south-facing monoclinal fold.

In Carr township, north of Bowman township, south-facing volcanic rocks extend northwards for 2 miles, abutting on the Destor-Porcupine Fault (Prest 1952, map No. 1951-1). These flows strike east-west and dip between 50°–65° south.

Although outcrops are scattered, it seems likely that there are continuous south-facing, steeply dipping volcanic rocks extending over 8½ miles from the Destor-Porcupine Fault in Carr township, south to the edge of the granite pluton in Bowman township. There is no apparent repetition of strata due to folding or faulting. Thus the true thickness of the volcanic sequence between these two locations is close to 8 miles.

Although shearing is evident in a large proportion of the exposed rock in the two townships, few rocks are fissile enough to be termed schists. Amphibolitic schists are found around the edge of the granitic pluton in Bowman township; chloritic schists are found in lots 7 and 9, concession I, Currie township.

The large faults striking north to northwest in the southwest quarter of Bowman township have been inferred mainly from topographic linears and the apparent displacement of diabase dikes. In the south half of lot 10, concession III, Bowman township, a poorly developed gneissosity, parallel to the inferred fault, is visible on close examination of the volcanic rocks.

An east-west fault in lot 6, concession VI, Currie township has been inferred to account for the apparent displacement of the Matachewan diabase dikes, occurring somewhere in the drift-covered area between the two outcrops. The displacement along this inferred fault is small but it may be important in that this area is the location of a former small but spectacular gold showing (Laird 1931).

Many minor faults offset numerous narrow acidic and basic dikes in the large outcrop in the central part of lot 9, concession VI, Currie township. Displacements along these faults are small, seldom being over a few feet.

ECONOMIC GEOLOGY

The results of the intermittent prospecting for gold in Currie and Bowman townships since at least 1917, have generally been discouraging. Old prospect pits are found on most of the quartz veins in the areas of volcanic rocks; some of the veins in the granitic area have been examined. One small copper showing in Bowman township failed to yield anything of economic importance.

The author has heard the opinion expressed by several prospectors that the area immediately south of the Destor-Porcupine Fault zone is unfavourable for economic gold occurrences. They point to the fact that at present all the producing mines of the Timmins area are located along the north side of the fault zone. To these individuals, Currie and Bowman townships are unlikely prospecting areas.

However, in Hislop township, just east of Bowman township, the Ross mine, which has been producing gold since 1935, is located south of the Destor-Porcupine Fault. One of the interesting features of the Ross mine geology is the great amount of acidic volcanic rocks such as tuffs, crystal tuffs (pseudoporphyry), and other fragmental rocks. The author is of the opinion that the

acidic pyroclastic rocks of Currie and Bowman townships are quite probably a continuation of the acidic volcanic zone in Hislop township. In the region of the Ross mine, these acidic volcanic rocks aid in unravelling the complex folding pattern of that area, whereas in Currie and Bowman townships the acidic volcanic sequence is probably structurally simple. If structure is the controlling factor of ore deposition in the area, then this point should be considered before possible exploration work in Currie and Bowman townships.

The Pleistocene deposits of the map-area have been, to date, the most important economically. An attempt was made to establish a clay brick and tile works at Matheson sometime in the early part of the century. The sand and gravel deposits of the area have been exploited intermittently for many years.

The following sections give a short description of the mineral showings and prospects in Currie and Bowman townships. Very little information is available in assessment work reports on mining activity in the map-area. Information supplied to the Ontario Department of Mines by Sylvanite Gold Mines Ltd. was the only data available for some of the showings.

Gold

Currie Township, Concession VI, Lot 6, North Half

An interesting gold find in this location has been reported by Laird (1931, pp. 21–22):

> A little over a year ago J. Anderson, farmer, made a spectacular discovery of native gold on his farm, north half of lot 6, concession VI, Currie township. The outcrop lies to the south of Anderson Lake and only a few hundred yards from the Ferguson highway. The interest and hope of prospectors and nearby farmers was so aroused that there was a mild rush to stake claims, some of which were located on the open sand plain to the south. The gold evidently occurred in a few small pockets in a quartz vein 2 feet wide. The vein followed a faulted zone in the Keewatin greenstone. The native gold, which was indeed of the spectacular variety, was soon completely removed. No more gold has been found, despite the fact that surface work has been pushed diligently. A picked specimen of the vein matter assayed by the Provincial Assay Office gave no values in gold per ton.

The present author visited the Anderson showing in August, 1962. A 15-foot deep shaft in the northern outcrop had been cleaned out, revealing an east-west shearing with several narrow quartz veins. Sparse pyrite mineralization was noted in the veins and wallrock.

The site of the original gold showing was in the southern outcrop, and was shown to the author by Mr. Anderson. This outcrop was mapped in detail (Fig. 2). Minor epidote, calcite, sphalerite, galena, chalcopyrite, and pyrite were observed in the quartz veins. Three grab samples of mineralized vein material, taken by the author and assayed by the Laboratory Branch, gave the following results: trace, trace, and 0.01 ounces of gold per ton.

Currie Township, Concession II, Lots 5 and 6, South Half

Laird (1931, p. 21) described a prospect here:

> . . . disclosed small lenses and discontinuous stringers of quartz in closely sheared and highly altered Keewatin pillow lavas. Silicified parts of this zone have given values up to $4.17 in gold per ton from handpicked specimens. For the most part the quartz appears to be barren of any mineralization; but in places where it is clouded with chloritic and aplitic material, fine iron sulphides are observed. Small quantities of zinc blende, malachite, and chalcopyrite are associated with fine iron sulphides in the sheared zones of the Keewatin lavas.

Currie Township, Concession II, Lot 1, North Half

Several shallow pits have been made in the amphibolitic basic volcanic rocks, where there are small quartz and quartz-carbonate veins. Minor sulphide mineralization in the veins and enclosing wall rock consists of pyrite, chalcopyrite, and pyrrhotite. Assays of three grab samples taken by the author of mineralized vein and wall rock material from this area showed only trace or no gold.

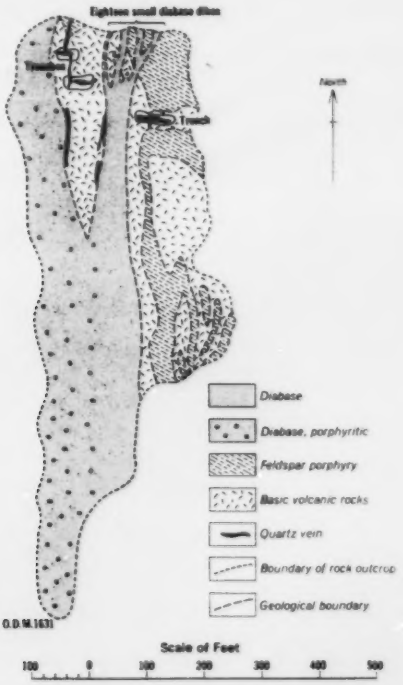

Fig. 2—Detailed geology of the location of the original Anderson gold discovery, Currie township.

Currie Township, Concession II, Lot 12, South Half

Several feldspar porphyry dikes, cutting porphyritic volcanic rocks, contain fine disseminated pyrite. Two grab samples of the dike material, taken by the author's senior assistant, on assay showed only a trace of gold.

Currie Township, Concession IV, Lot 1, South Half

Segregations of garnet, epidote, quartz, and carbonate were found in the basic volcanic rocks in this area. A grab sample of this material, which contained finely disseminated pyrite, was taken by the author for assay; it showed only a trace of gold.

Bowman Township, Concession II, Lots 2, 6, 7, 8

The earliest record of mining activity in the map-area is reported by Knight, *et al* (1919, p. 63):

> Some prospecting was carried on a few years ago in the southern part of Bowman township, particularly in lots 2, 6, 7, and 8 of concession II. The rocks are hornblende schist and pillow lava intruded by stocks of gabbro and dikes of porphyry, granite and diabase. On the Turcott claim, southeast quarter of south half of lot 6, concession II, and in the immediate vicinity, there are several narrow veins usually widely spaced, some of which will yield low assay values in gold. Near the south part of lot 2, concession II, on the Campbell-Moore claim, is a vein from one foot to four feet wide, striking east and west and dipping 60° north, which contains low values in gold.

Bowman Township, Concession I, Lot 2, North Half, and Concession II, Lot 2, South Half

This area of coarse-grained basic volcanic rocks has at least five old prospect pits in it. Quartz veins are quite common here, usually containing considerable epidote. No sulphide minerals were observed in any of these veins. A small segregation of pyrite in the volcanic rocks was indicated by a heavy gossan staining; a sample of this material taken by the author showed no values in gold when assayed.

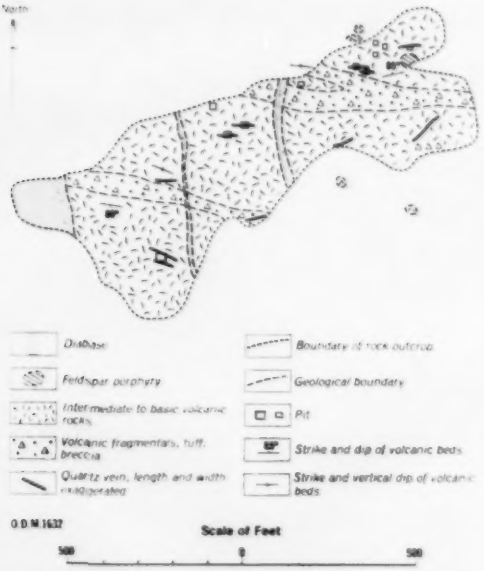

Fig 3—Detailed geology of the outcrop in the north half of lot 2, concession III, Bowman township.

Bowman Township, Concession III, Lots 2 and 3

The large outcrop in the north half of lot 2, concession III may warrant further careful prospecting. The outcrop consists essentially of basic lavas with minor flow breccia and tuff. Narrow quartz and quartz-carbonate veins strike approximately east-west and dip vertically, and most of these contain some

disseminated pyrite. At least ten small prospect pits are located in this outcrop. Fourteen grab samples assayed by Sylvanite Gold Mines Ltd., in 1935, gave the following results: 0.04, 0.06, 0.06, 0.04, 0.06, 0.10, 0.06, 0.04, 0.02 ounces of gold per ton, while the remaining five samples indicated trace amounts of gold.

The author mapped this outcrop area in more detail (Fig. 3) than is shown on the geological map (back pocket). There are three sets of quartz veins in the outcrop. The veins striking northeasterly and the veins striking northwesterly all dip to the north. These two sets of veins consist of glassy bull quartz, and no sulphides were observed in them.

The third set of veins strike generally east-west, sometimes contain carbonate minerals, and nearly all contain some disseminated pyrite. Samples of vein material and wall rock, taken by the author, gave the following results on assay by the Laboratory Branch: 0.01, trace, 0.11, 0.04, 0.04, 0.02, trace, 0.14, 0.01, 0.02, 0.01, 0.06 and 0.06 ounces of gold per ton.

The outcrops in the south half of lot 2, concession III, also contain narrow quartz veins and signs of previous prospecting. Fourteen samples of vein material and wallrock taken from this area by the author's senior assistant showed only low values in gold when assayed, the highest assay being 0.04 ounces of gold per ton.

Bowman Township, Concession V, Lot 6, North Half

Spectacular free gold was supposed to have been found in a 2½-foot-wide quartz vein, cutting feldspar porphyry in this location. Trenching was carried out along a length of about 90 feet and for an average depth of 5 feet. Twelve samples from this vein taken and assayed by Sylvanite Gold Mines Ltd. showed only trace to 0.01 ounces of gold per ton.

This outcrop area and the trench were nearly covered over by small second growth shrubs when visited by the author in 1963. The narrow outcrop is along the side of a high clay hill and disappears under low swampy ground just to the east of the hill. The quartz vein was not located, but most of the broken vein material lying around the trench was barren of any sulphide mineralization. Some pieces of quartz-carbonate vein material were also seen.

The porphyritic host rock is highly silicified and usually strongly mineralized with fine disseminated pyrite. About half way along the trench, the rock appears to have been shattered and then re-cemented by silica, and in this same area a narrow zone of sericitic-carbonate schist has been developed. In this schistose zone a few small specks of green mica (mariposite?) were noted.

Nine samples of pyrite-bearing porphyry, along with some vein material, taken at uneven intervals along the length of the trench by the author, on being assayed by the Laboratory Branch, showed from trace to 0.02 ounces of gold per ton. While assay results were disappointingly low for this interesting area, the amount of outcrop exposed is so small that further work in this area might prove rewarding. If further work is done here, the prospector should notice that a quartz diabase dike probably lies just west of the porphyry, and would soon be exposed by surface work carried out in this direction.

Bowman Township, Concession VI, Lot 4, South Half

Several outcrops of silicified basic volcanic rocks and quartz diabase are found projecting along the sides of the sand and gravel hills in this area. Several

quartz and quartz-epidote veins have been opened up by prospect pits. It is difficult to differentiate between exposed bedrock and large glacial boulders in this location. Nothing of economic significance was noted here by the author. Information, received from Sylvanite Gold Mines Ltd., revealed that this company had examined this area in 1936–37; thirty-three samples taken from this area and assayed by the company showed from trace to 0.1 ounces of gold per ton.

Copper

Bowman Township, Concession II, Lots, 6, 7, 8, 9

In 1956, Sylvanite Gold Mines Ltd. took an option on an old copper showing, which was discovered in the southeast quarter of the north half, of lot 7, concession II. Three short drillholes were put down in this location previous to the option. Sylvanite Gold Mines Ltd. put down three more drillholes with a total length of about 650 feet. Considerable trenching has been done in the location of the original showing, as well as in the adjacent area.

The showing consisted of splashes of massive chalcopyrite in a grey feldspar porphyry and along the contacts of the porphyry and the enclosing volcanic rocks. Assays of chip samples taken by Sylvanite Gold Mines Ltd. were reported to be 1.80 percent copper across 6.9 feet and 0.6 percent copper across 5.6 feet. The drillholes and surface work failed to develop anything of further interest and the option was dropped.

Grab samples of two pyrite-bearing quartz veins in the south half of lot 6, concession II, taken by the author, showed no values in gold when assayed.

Sand and Gravel

Pleistocene deposits of sand and gravel in the map-area have been a good source of constructional material for many years. In Bowman township, the

Gravel pit in lot 4, concession VI, Bowman township.

gravel deposits, just south of Matheson, are utilized by the Ontario Department of Highways as well as by local contractors.

The deposits are sure to be a ready source of gravel for many years to come; in 1963 tests were being made of some of the gravels in the central part of Bowman township as an aid to future development.

Clay

Stratified clay deposits are widespread in the area around Currie and Bowman townships. The location of an old brick plant is shown on O.D.M. map No. 45d (Moore 1937), immediately east of the town of Matheson; Hughes (1956) reported that the bricks, made from the local stratified clays, weathered and disintegrated rapidly.

Guillet[1] has furnished information on stratified clays which he sampled about two miles north of Matheson:

> The clay is typically varved in ½-inch layers at the base and near the top of the section, but the middle of the bank is a massive, tough, brown, stoneless clay. The lower varved section is grey in colour, while the clays above are brown, due to oxidation. Three samples channeled from the bank gave almost identical results for the three clay units mentioned. They are highly plastic, and burn to an attractive cream-coloured, smooth, hard brick at a low temperature (1700°–1800°F.). The fusion point is cone 4 (2150°F.). Test briquettes have a lineal drying shrinkage of 8 percent and a lineal firing shrinkage of 3 percent. Absorption of cold water after an immersion of 24 hours was 19 percent; after 5-hour boiling it was 20 percent. Saturation coefficient (ratio of 24-hour cold water absorption to 5-hour boiling absorption) is 0.95. The Canadian Standards Association specifies that the maximum saturation coefficient be 0.80 for exposed brick. In most other respects the clay appears to make a satisfactory brick, . . . it would be improved by the addition of about 25 percent of sand to reduce the plasticity and drying shrinkage.
>
> The Matheson area clays have no unusual ceramic properties to distinguish them from other stoneless clays widespread throughout northern Ontario. With suitable additions of sand and minor additives, most could be used to produce brick or drain tile. The main problem is one of economics. . . . It appears to be cheaper to make brick from large uniform deposits of Dundas or Queenston shale at Toronto and Hamilton, and ship it by truck or rail to the northern communities.

[1]Guillet, G. R., geologist, Ontario Department of Mines, personal communication.

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